In this paper we explore ideas for extending these paradigms and architectures adopted to the requirements of the expected range of future experiments needs at Fermilab. We describe some of the concepts and implementations of the existing DART hardware and software architectures that make it a cost effective solution, suitable for extension to future technologies and experiment needs.

Additionally we will describe ongoing current R and D developments in the Computing Division that can be interfaced to and integrated with these architectures, in the areas of: high performance, parallel, programmable trigger processing; ATM and Fiber Channel switch networks; integration of and interface of online systems to centralized data storage and data analysis facilities; multiple on-detector ASICs which need downloading, control and monitoring.

Some of the areas we cover will include discussion of

a) the data collection and processing levels and layers.

The decoupling of the upper level hardware and software are from the front end readout scheme and number of "levels" of the data acquisition readout architecture. Event data is delivered to buffer memories up multiple parallel cables with minimal control - initial wordcount either in the data or pre-pended by a readout controller, or an End or Record strobe (EOR), and a BUSY return; Event data is readout and collected into sub-events or events from these buffer memories independently without the need to know the source of the data.

b) whether, when and how to build events.

Current DART experiments have no common definition of the "Event Builder". Each experiment has chosen the most efficient and effective point at which to finally tie together all the data from a single event - and it turns out that this is different from experiment to experiment.

Within DART there is a loose coupling between the level 3 event filter processors and the event collection system itself. This allows easy replacement by other event building and delivery paradigm. In the current implementation the event data is provided to level 3 filter processors independently over multiple VME crate backplanes and workstation-VME adaptors. The locally attached processors perform readout, processing and logging of sets of the events. Delivery of the data to filter processors through an alternative switch architecture can easily be accommodated.

c) distributed standard communication and control protocols and interfaces.

The DART control and communication architecture implements management and monitoring of arbitrarily connected, heterogenous, loosely-coupled systems. It supports integration of the needed slow control and monitoring sub-systems with the control of the main high speed data acquisition system, as well as the implementation of sub-systems for commissioning and testing with later integration to a orchestrated whole.

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Integrating Data Acquisition and Offline Processing Systems

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APEX and MINIMAX are two small experiments currently taking data during the Fermilab Collider Run. Because of the small size of the experiments, their low data collection rates (50-100 Hz event rate and 400-1000 byte event size) and the very restricted manpower available, they take data with the legacy VMS based VAXONLINE system. During their six-twelve months of data taking, the experimenters have been proactive in extending the "counting room" to the central Fermilab UNIX analysis computers through the use of Andrews File System (AFS).

Services on the central Fermilab UNIX cluster - FNALU - are in the process of being developed to support future experiments offline processing and analysis requirements. APEX and Minimax use of these facilities at this time is acting as a prototype and beta testing project to help in determining the right configuration and mix of services to be provided.

We report on the infrastructure and services used - integration of the centrally provided AFS disks in the online environment, batch job scheduling and feedback to the counting room and data transfer and analysis rates obtained. We include observations of the positive and negative aspects of migrating legacy experiments and experimenters to this new operating paradigm.

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The DAQ and Trigger system of the ATLAS experiment at the LHC

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